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ABSTRACT

This problem-assessment study sought answers to the problems of why there are relatively few women in mathematics, what encouraged or discouraged contemporary women mathematicians, and what can be done to attract more women to the mathematical sciences. A questionnaire was developed and sent to members of the Association for Women in Mathematics (AWM). This document contains an analysis of the responses to the questionnaire, career patterns and interests, AWM respondents' present status, international problems, and varied attempts at explanations. The questionnaire and tables of responses are included in the appendices. (DT)

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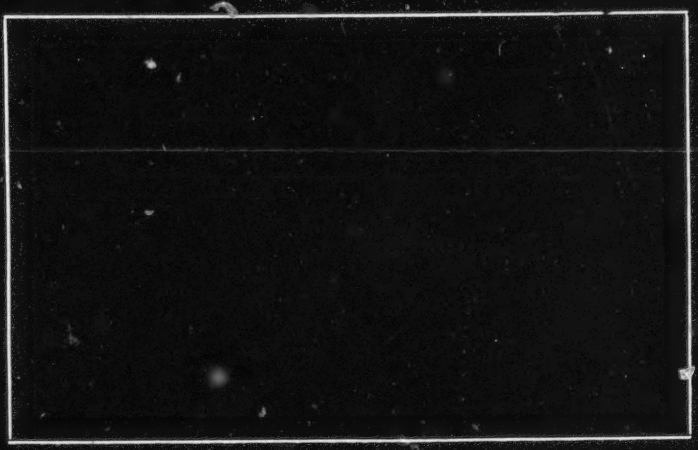

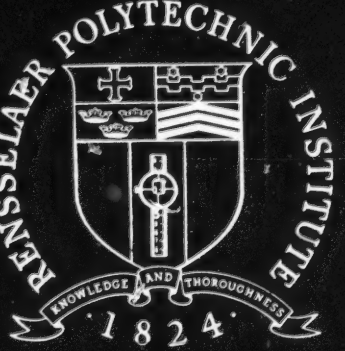

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WOMEN IN MATHEMATICS: PROBLEMS OF ORIENTATION AND REORIENTATION

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The study was done in association with Dr. Abraham S. Luchins, Professor of Psychology, State University of New York at Albany.

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Table of Contents

	Page
Acknowledgments	iii
Introduction	1
Analysis of Responses to AWM Questionnaire	2
Career Patterns and Interests	12
AWM Respondents' Present Status	16
International Problems	18
Varied Attempts at Explanations	20
Conclusions and Recommendations	22
Footnotes and References	29
Appendix A. Questionnaires	32
Appendix B. Tables of Responses	44

INTRODUCTION

This problem-assessment study was done at Rensselaer Polytechnic Institute under a grant from the National Science Foundation, administered by the Education Directorate. It sought answers to the problems of why there are relatively few women in mathematics, what has encouraged or discouraged contemporary women mathematicians, and what can be done to attract more women to the mathematical sciences. A multifaceted interdisciplinary approach has been used. Interviews were conducted with female and male mathematicians, ranging from established scholars to recent Ph.D.'s. Most of the interviews were held at mathematical conventions: international, national and regional meetings, including general and specialized conventions, such as those in algebra and in applied mathematics. Some of the interviews were done during visits to colleges in the United States and Canada, where we usually talked to heads of mathematics departments and women mathematicians. Various questionnaires were developed and were answered by hundreds of mathematicians. In addition, questionnaires and tests were used with several hundred women and men undergraduate and graduate students, who were majoring in mathematics and in other disciplines. Comparisons are being made with psychology. Why psychology? For one thing, because it is of interest to compare the problems of women in different disciplines. For another, because psychology, like mathematics, is both a science and an art, but one which attracts relatively more women, even more than the biological sciences. For example, the proportion of women among those who received the Ph.D. degrees during 1960-1969 were as follows:[1]

discipline	% of women awarded Ph.D.
mathematical sciences	5.7
biological sciences	15.1
psychology	20.7

Moreover, a recent National Science Foundation survey showed that about 30 per cent of the psychologists in the United States are women; only about 10% of the mathematicians in this country are women. Still another reason is that the investigators in the study have long worked in areas that relate mathematics and

psychology. It is hoped to study more psychologists' responses in 1976. The present report touches on their replies and focuses on the responses of mathematicians.

Analysis of Responses to AWM Questionnaire

After being tried in several preliminary versions, a questionnaire was sent to members of the Association for Women in Mathematics (AWM); a copy is appended. For richness and quality of responses, we preferred an open-ended questionnaire even though it takes longer to answer and to score. There has been a high rate of response and many respondents add comments on the back or on additional sheets, in some case three or more sheets. Qualitative and quantitative analysis has been done on the responses from 350 women and 52 men. They constitute about 40% of the approximately 1,000 members of the AWM, of whom about 200 are males.[2] We touch here on highlights of the responses; the appended tables contain more detailed results.

1. The data suggest that interest in mathematics and the decision to become a mathematician tended to occur at an early age. (Such early interest and early career decisions with regard to their discipline were not typical of the psychologists we surveyed.) Some of the AWM respondents, more often the males, recall being interested in mathematics before they could read or write. This interest occurred during the pre-school period or by age 6 for 13% of the females and 17% of the males. About one-third of the women and half of the men remember being attracted to mathematics by the time they were in elementary school or by age 11. For most of the others the initial interest occurred in high school, usually in algebra and geometry courses. Less than 2% report that they were first attracted by calculus and less than 1% by trigonometry.

Why were they attracted to mathematics? "Why does a duck swim?" was the way one women mathematician worded it. It came naturally to them, they were good at it, they likedit, were the most frequent reasons offered. About a fifth of each group mentioned the fascination of the order, structure and beauty of

mathematics, or the fun and challenge offered by its problem solving or puzzle solving aspects. A similar proportion said that they were attracted to mathematics because they were impressed by their teachers.

Age of first interest in math	% Female (n=350)	% Male (n=52)
< 6 or pre-school	13	17
7 - 11 or elementary school	22	29
12 - 17 or secondary school	53	40
18 - 21 or undergraduate	6	12

Age of math career decision		
7 - 11 or elementary school	3	6
12 - 17 or secondary school	33	25
18 - 21 or undergraduate level	43	46
21 - 25 or graduate level	7	11
later	9	4

That the age of first interest was considerably earlier than that reported for psychology by psychologists is understandable since psychology does not play the same role as do numbers and shapes in the behavioral world of the child, and it is not introduced as a formal subject in early education. What is noteworthy is that initial interest in mathematics tended to occur at a somewhat later age for present mathematics majors than for professionals (influence of T.V. or New Math?). Yet it tended to occur at an earlier age than for the other disciplines in which the undergraduate students we questioned were majoring (see Appendix for questionnaires). This was also true for career decisions which on the average occurred earlier for mathematics than for other disciplines, with the exception of medicine - by and large biomedical and premedical students always wanted to be doctors!

2. About a third of each group decided on a career in mathematics by the time they were in high school and, for somewhat more of the males, while still in elementary school. About half of each group made the career decision in undergraduate school; of the remainder, more of the men decided to become mathematicians while in graduate school or before age 25, and more of the women did so after this period. (Some of these women first realized then that mathematics careers were open to them.) Twice as many women as men said that they chose mathematics because of the job opportunities it offered or because they wanted to teach it. About a quarter of each group mentioned that they preferred it to other disciplines, with 13% of the women and 23% of the men choosing it over an experimental science. Applications to other fields were infrequently mentioned as reasons for their career choices, but somewhat more often by the women. The most frequent explanations, given by about half of the women and three-quarters of the men, were that they were good at mathematics and enjoyed it.

3. Encouragement by others was spontaneously mentioned by few respondents as a reason for their career decisions. Only 4% of the women and 2% of the men said that they decided to become mathematicians because of encouragement by family and friends; and 9% and 4% respectively said they did so because of encouragement by teachers and advisors. However, as the following tabulation shows, these people were more often mentioned in response to the next question: What people or factors encouraged or facilitated your decision to be a mathematician?

encouraged by	% Female (n=350)	% Male (n=52)
family, friends	38	27
teachers	64	69
pre-college level	29	14
undergraduate level	31	39
graduate level	6	15
advisors	9	8
colleagues, professional level	7	8
some person or persons	78	81

Somewhat more women than men remember being encouraged by their family and friends, while the reverse holds in the case of teachers. The encouragement was uneven for both groups, but more markedly so of the women; only a fifth as many women were encouraged on the graduate level as on the previous levels. About four-fifths of each group mentioned that at least one person encouraged them. Encouraging factors other than people were given by about one-third of the women and one-quarter of the men. Most frequently cited were their ability and liking for math (15% of the women and 10% of the men) and fellowship, scholarship, and other aid (6% and 4% respectively).

4. Striking results were obtained in response to the question: What people or factors discouraged or hampered your decision to be a mathematician?

discouraged by	% Females	% Males
family, friends	17	13
teachers	21	8
pre-college level	4	2
undergraduate level	8	4
graduate level	11	2
advisors	11	4
some persons or persons	46	27

More women than men recalled being discouraged by family and friends. How were the women discouraged? For example: My sister teased that I'd turn into a boy; my mother worried that boys wouldn't like me or date me; my father thought I wasn't serious enough to be a mathematician. Three times as many women as men were discouraged by teachers or advisors, with the difference in each case most marked at the graduate level. For example: the teachers expected less of the girls; my teacher paid attention only to the boys; my counselor said girls didn't do well in math; my advisor asked why I wasn't home having babies. Sexist reasons for the discouragement were given by a fifth of the women but none of the men. Almost half of the women recall being discouraged by one or more persons, which statistically is significantly more than the men. But it is surely not insignificant that over one-

quarter of the men - most of whom are now college professors - recall being discouraged somewhere along the line. (Women psychologists in our survey also reported more discouragement than men but not to as great a degree.)

5. Even more striking results were obtained when they were asked: Were you treated differently because of being female (or male) as a mathematics student or as a mathematics professional? That they encountered such treatment was reported by 80% of the women and 9% of the men. Moreover, such reports increased for the women as their training progressed but remained low for the men.

Different treatment at	% Females	% Males
pre-college level	23	6
undergraduate level	26	8
graduate level	43	8
professional level	54	4
any level	80	9

Furthermore, the frequency of complaints was about as great or greater for the younger women as for the older ones

Age	#	%
20 - 30	100	72
31 - 35	100	86
36 - 45	75	60
46 - 70	70	71

Among the complaints were that on the precollegiate level some were treated as "strange" by their peers; they were told that boys do not like or are afraid of smart girls, especially math whizzes, their teachers paid more attention to the boys or expected less of the girls; and they were advised to consider more traditional careers. At the undergraduate level, and even more on the graduate level, some of their teachers and advisors questioned their competence or did not take seriously their interest in mathematics; more than the men, they had to prove

themselves. Some of them were confronted with the assertion that a woman would get married and have children and either not finish the degree or not pursue a career in mathematics. At the professional level, some reported denial of employment, receiving lower salary, or having less advancement potential than equally or less qualified males. According to our respondents' conceptions, affirmative action has not yet been effective. The younger women mentioned that they were frequently interviewed for positions but seldom offered them. In some cases there seemed to be a kind of backlash, e.g., the fear that if in the future a woman's contract was not renewed or she was not granted tenure, then the university would be accused of having discriminated against women. On the other hand, a few women who were appointed, as the token woman in the department, had the feeling that this was done mainly to comply with affirmative action requirements. Some said that they were given temporary positions and it was expected that they would teach only the lower level courses and would take care of such traditionally female responsibilities as school social functions. Another complaint was that they felt isolated from their male colleagues, socially and mathematically, or that they had the impression their colleagues felt restrained or uncomfortable when they were around. Interviews with male mathematicians suggest that there may be some basis for this feeling, because a few of them admit that they would feel uncomfortable with a woman colleague or even women graduate students. One mathematician claimed that because of the close relationship between doctoral advisor and advisee, he would not want to have a woman doctoral student (and even if he did, his wife would not want him to). Moreover, because of deep-rooted social mores, he could feel protective or patronizing toward a woman mathematician but not at ease with her. He pointed out that it would take time to change such attitudes. However, most mathematicians who were interviewed said that they would welcome mathematically talented women students and colleagues.

6. Returning to the AWM respondents, we find that over 90% agree that changes should be made if women are to be encouraged to consider mathematics as a career. The female and male respondents

tend to agree on the nature of the changes. For instance, the recommendations for the pre-college level were as follows:

Pre-college	% Females	% Males
change attitudes toward math as unfeminine	36	42
make teachers & advisors more aware of math career opportunities	21	21
more female role models	17	17
equal treatment of males & females	14	19
encourage or don't discourage women	12	10
greater emphasis on math, advise four years of high school math	11	6
no changes needed	2	0

There is a close tie-in between the two most frequently recommended changes; weakening of the notion of mathematics as a masculine domain may be brought about by making teachers and advisors more aware of career opportunities in mathematics for both men and women. This was strikingly evident on visits to high schools where counselors admitted discouraging girls from pursuing mathematics because they did not think it offered opportunities for them. Moreover, students and parents also need to be made more aware of these opportunities. Of the students we questioned who had changed their minds about being math majoes, a common reason for the switch was that they did not know what one did with mathematics except to teach it. Clearly more information has to be spread about the varied career options which are opened up by training in mathematics. We shall return to this matter and to other suggestions for changes given by the AWM respondents.

7. That at the present time more women should be encouraged to study mathematics is agreed to by 81% of the female and 75% of the male respondents. Those who disagree do so mainly because they think jobs are not available now for either sex or that only those who are highly talented should be encouraged.

8. If a talented female math student is considering mathematics as a career, possibly combined with marriage and a family, what advice would you give her? Only two women and one man tell her not to do it. About half of each group tell her to do it, without giving specific advice. The others offer advice, the most frequent, given by about one-quarter of each group, being to choose carefully, since she'll need an understanding spouse. Over 10% of each group tell her to be prepared for difficulties that may arise.

9. Why do you think that there have been relatively few women mathematicians and why are there few at present? Consider the nature of the replies: (some respondents gave more than one answer)

Response	% Females	% Males
1. mathematics is not a special case	6	6
2. social and cultural reasons	78	75
3. women prefer other disciplines and careers	6	4
4. don't know	4	15

Note that relatively more men than women said that they did not know any reasons for the scarcity of women mathematicians. What the tabulation does not show is that there are some differences between female and male mathematicians in the kinds of social and cultural reasons that they give. The women tended to give more specific reasons. Also, 16% of the women but only 6% of the men reported that academic interests are not encouraged for women. Moreover, 16% of the women but only 2% of the men note that traditional responsibilities do not allow a demanding career for a woman. Equally important are what the groups do not say. They do not attribute the differences to greater mathematical talent on the part of the women or to differences in dominance of one or another cortical hemisphere, etc., which were among the attempted explanations given by mathematicians and psychologists whom we interviewed.

10. When mathematicians at various meetings were asked to list five outstanding contemporary mathematicians, a woman's name was seldom given. The difficulty of the task was the embarrassment of riches. However, when they were asked to list five outstanding contemporary women, many claimed that they did not know five and some named none. Those who did name some women showed a slight tendency for their choices to reflect their familiarity with a given specialty or literature. For example, at the algebra convention more algebraists were named, at the applied mathematics convention more women in this area or in analysis or partial differential equations , and at the international convention a few limited themselves to mathematicians from their own countries.

To simplify the task, on the AWM questionnaire it was changed to: Whom do you consider the three most outstanding contemporary women mathematicians? Now 50% of the women and 21% of the men did not give even one name. In part this may reflect resentment of the question. About one-quarter of the women and fewer of the men said that they did not know any outstanding contemporary women mathematicians. Those who gave reasons usually mentioned their own lack of acquaintance with research literature and/or the insufficient visibility of women mathematicians.

About half of the respondents listed one or more names. There was more agreement among the men than the women. The top three choices for the men were selected by 29, 23 and 23% of them whereas the top three for the women were selected by 17, 12 and 9% respectively. There were some striking variations between the two groups, e.g., the fourth choice for the men (a Russian analyst), who was named by 19% of them. was only in ninth rank for the women and received only slightly more than 2% of their votes.

Nonetheless, there was some consensus among the women and men. They agreed on the top three names, but not in the same ranking. (We had previously interviewed these outstanding mathematicians as well as the next three choices made by the women.) Moreover, there were 25 names in common to the two lists. Most of them were American. Their number, and the quality of their work and recognition, apparently give the lie to the

statement, which is attributed to unknown mathematicians in a recent book on university antibias regulations,[3] that there are only one or two female mathematicians in the whole country who are qualified to hold a tenured position in a major university. Several women on the list (whom we interviewed) hold such positions and others are qualified to do so. While women are certainly underrepresented at the major universities, it is not solely because of a lack of qualified candidates.

Career Patterns and Interests

1'. The same proportion of the women and men had never considered a career other than mathematics. Proportionately fewer women had considered careers in engineering or the physical sciences (but about the same in chemistry), or the biological sciences, medicine or law, with the difference most striking for physics (13% vs. 33%) and engineering (8% vs. 33%).

Career area	% Females	% Males
no other considered	14	13
physics	13	33
chemistry	11	13
biology	5	8
engineering	8	33
medicine	11	15

More women had considered careers in computer science (10% vs. 4%) and in education and teaching, other than college teaching of mathematics (16% vs. 10%). Also, relatively more women had considered careers in psychology and philosophy; in history language and literature, in art, as well as in music, dance and drama (13% vs. 4%). Only 3% of the women mentioned that they considered a housewife career.

2'. Why did they prefer mathematics to each of the careers they had considered? About a fifth of the respondents did not answer. That they did not really "choose" mathematics over the other careers (e.g., that it just happened or they never made a deliberate choice among them) was mentioned by 18% of the women and 10% of the men. The others usually cited their liking and ability in mathematics or the nature of mathematics itself.

Reason for preferring mathematics	% Females	% Males
no response	20	19
did not "choose" math over other career	18	10
liked math better	29	19
did well or better in math	12	19
math more precise, challenging	17	31
math more creative	14	13
math more exciting	7	17
better career opportunities	12	8
preferred academic career	9	2
no opportunity to pursue other	7	8
other fields not available to women	4	0

Note that more women than men mentioned the career opportunities offered by mathematics, and some stipulated that they preferred an academic career (with its greater flexibility in time, scheduling, etc.) that was opened to them by mathematics.

3'. Over a fifth of the women and even more of the men (29%) had never held a non-mathematical position. The women had held a greater variety of such positions. About a fifth of each group had been involved in teaching of non-mathematical subjects. Library work was reported by five times as many women (21% vs. 4%). Service positions for women (11%) were mainly waitress, house maid and baby sitter, and for men (8%) mainly waiter and gas station attendant. Office work, usually clerical and bookkeeping, were reported by three times as many women (12% bs. 4%).

4'. The kinds of mathematical positions that they had ever held showed that somewhat more women had taught on the pre-college level (usually high-school) and more men on the college or university level. About 30% of each group had held non-academic mathematical positions with more women in computing and statistics, and more men in industry and government.

Mathematical positions	% Females	% Males
academic	89	98
pre-college	17	10
college or university	81	89
non-academic	30	31
computing	12	6
industry, government	11	23
statistician	6	2

5'. How was your career pattern influenced by your being a female (or male)? About 70% of the women and 30% of the men said that it was influenced. The men mentioned that they were drafted into the Army, that they got positions females would not get and that they had more time to devote to careers than if they were females. Of the females, 18% mentioned that their careers were interrupted because of family responsibilities and 15% that their location of employment was dictated by their spouses' careers. Only 7% mention that they had difficulties in combining job and family responsibilities. A similar proportion note that they took an academic job in order to have time for their families or because of its flexible time schedule.

6'. A greater variety of mathematical specialties was listed by the women and there were also differences in frequency of preference. The top listings were as follows:

	% Females		% Males
Algebra	23.0	Analysis	38.5
Analysis	13.2	Topology	23.1
Topology	10.9	Algebra	13.5
Mathematics Education	10.9	Number Theory	11.5
Probability and Statistics	8.6	Probability and Statistics	7.7
Computer Science	6.9	Geometry	5.8
Number Theory	4.6	Computer Science	3.9

Algebra, given most frequently by the women, ranked third

for the men. Analysis was the women's second choice but was the men's first choice, chosen by three times as many of them. Topology was chosen twice as often by the men. Is this because Algebra has more verbal content, while Analysis and Topology require more spatial perception? It is also interesting to speculate why Mathematics Education was tied for third rank by the women but not even listed by the men.

7'. Various reasons were given for liking their specialties, among them their practical applications (17% F and 23% M), their structure and beauty (12% F and 8% M), and its relation to other fields (4% F and 14% M), that they are fun (6% F and 8% M), and their abstractness (3% F and 6% M). About 7% of the women but none of the men noted that they like their specialties because they deal with people.

AWM Respondents' Present Status

8'. The mean age of the female respondents is 37 years, of the males 42 years. Nearly all have graduate degrees; it is noteworthy that the highest degree was received within the past five years by half of the women and one-fifth of the men. The doctoral degree is held by 68% of the women and by significantly more of the men, 98%. About 70% and 90% respectively are in the academic world, where the men hold the higher ranks. Numbers of years of employment as a mathematician average 10 for the women and 17 for the men.

Data on marital status shows that fewer are single and divorced than in other studies of scientists.[4]

	% Females	% Males
single	26	12
married	63	83
divorced	9	6

Of those who have been or are now married, over 70% have children. Thus the average respondent, female or male, is married and has children - quite different from the usual conception of a mathematician.[5]

The spouses of both female and male respondents were in professional occupations, 36% in the academic world for each group. The spouse was a mathematician for 30% of the female and 6% of the male respondents. Most respondents consider that mathematics is a good career for women and think it can fairly readily be combined with marriage and family, especially with the help of an understanding spouse. Some think it is easier to do so for mathematics than for other sciences, since it does not usually require laboratory or special equipment, and can be done at home. (If computers should be needed for one's work, it is predicted that within a few years they will be as close as the nearest telephone.)

Comparisons of single and married women respondents showed no statistically significant differences between them for mean

age, percentage with doctoral degrees, mean number of years employed as a mathematician, or proportion at various academic ranks. This is not in line with the contention that single women make the same career progress as men and that only married women are disadvantaged (cf. Lester, 1974, and the review of his book).[3] To use marriage as an excuse for obstacles faced by women mathematicians is inexcusable. The following summarizes some of the career data on single and married women respondents.

		Females	
		Single (n=92)	Married (n=221)
Mean age		36.6	37.4
% highest degree	bachelors	3.3	3.1
	masters	27.1	31.8
	doctoral	68.6	66.3
Mean years math employment		9.6	9.7

Of each group about one-tenth are at the instructor level and also at the full professor level, about one-third at the assistant professor, and half as many at the associate professor level. (In contrast none of the male respondents is an instructor, one-quarter are associate professors and one-half full professors.) Comparison was also made of 93 women whose highest degree is the masters degree with 239 who hold the doctoral degree (most but not all Ph.D.'s). It shows that relatively more of the former are instructors (18% vs. 8%) and fewer associate professors (11% vs. 17%) or full professors (4% vs. 12%). In general, our data reveal more women at the lowest academic ranks and fewer at the highest ranks than the survey done in 1972 of women with the Ph.D. degree.[5]

International Problems

The problems with which the study is concerned are international in scope. This was evident at the International Congress of Mathematicians (ICM). The Congress, which is held once every four years, met during August 1974 in Vancouver, Canada, at the University of British Columbia. Its mathematics department kindly made available data on the mathematicians registered for the Congress - who are known as delegates - from which we extracted information about the women. About 250 in number, they represented 7% of the approximately 3,500 delegates. The women came from 27 countries, the men from 72. One-quarter of the women delegates were married to mathematicians attending the Congress, and some were accompanied by their children. Only two of the hundred invited addresses were made by women, an American and a French mathematician. The largest female delegation, over 100 women, was from the United States and represented 8% of its delegates. The second largest, 35 women, was from France and represented 14% of its delegates. This may reflect the higher ratio of women mathematicians in France. It is also relatively high in Russia, where a book has appeared about its women mathematicians.

The numbers and percentages of women among the delegates of selected countries to International Congress of Mathematicians were as follows:

Country	# Delegates	# Women	% Women
France	245	35	14
United States	1274	100	8
England	181	15	8
Russia	50	4	8
Japan	114	8	7
Canada	514	20	4

Female delegations, averaging about eight each, came from Germany, Italy, and Japan and, averaging about four each, from Australia, Norway, and the USSR. Two female mathematicians came from each of Finland, the Netherlands, and Scotland. At least one female mathematician came from each of the following countries:

Belgium, Greece, India, Iraq, Kenya, Kuwait, New Zealand, Phillipines, Poland, Scotland, Vietnam and Yugoslavia.

When asked why there were relatively many female mathematicians in France, one Frenchman said that it was because women have had equality there for over a century. A French mathematician, a mother of a young child, believed that a contributing factor was the availability of household help. But another French woman, a professor of mathematics, claimed that most female mathematicians in her country have low ranking, insecure positions, and encounter discrimination similar to that faced by women elsewhere.

Various demographic and cultural factors have been suggested to account for the different ratios of women mathematicians in different countries. To deal adequately with the barriers to mathematical careers for women may call for international study and cooperation.

Varied Attempts at Explanations

We asked mathematicians and psychologists why there are relatively few women mathematicians. Many and diverse explanations were offered. Marriage and family responsibilities were cited by mathematicians from many countries. Noting that these responsibilities traditionally are assumed at about the time of graduate study and early research work, and pointing out that the resulting interruptions are particularly disruptive in mathematics because of the early and relatively short creative period, a leading European mathematician thought that they might help to explain why in his country women were "well represented among the graduate students but not among the research mathematicians." He also added that perhaps women do not have as much interest in mathematics or as much mathematical talent or ability as men. Variations on these themes were heard from other mathematicians and, worded more elegantly, from psychologists. It was noted that mathematics is essentially a lonely, a solitary activity, and that women are more socially, more people-oriented. Reference was made to the difficulty or mathematics, to the intense concentration and devotion it requires, which women either are not willing or not able to give. One pure mathematician characterized mathematical thinking as the purest, the highest type of thinking, devoid of the noise of reality. He implied that women do not attain to these heights or are more easily distracted. Care was usually taken to point out that women are not less intelligent than men but that they have different kinds of talents, skills or intelligence (or that they are too smart to go into mathematics). Psychologists referred to sex differences in verbal skills and spatial perception. Such differences may help to explain why girls are among the top winners in the language Olympics in Poland, but not the mathematics Olympics in that country, or ours. These differences, as well as differences in perceptual restructuring, rigidity-flexibility and cognitive style, were attributed by psychologists to various cultural and biological factors. They referred to the controversial hypotheses about the dominance of the left cerebral hemisphere in women and the right hemisphere in men. But by and

large, both mathematicians and psychologists stress that attitudes toward, and social conceptions or misconceptions about women and mathematics, contribute to the problems. Our findings about the career patterns of women mathematicians, as well as other evidence, make us wonder to what extent members of both professions may themselves be contributing to these misconceptions.[6]

Conclusions and Recommendations:

1. More varied study and career opportunities:

a. There are areas which presently are in need of mathematical personnel, such as operations research, computer science, and such interdisciplinary areas as mathematical biology. Women would do well to explore such areas.

b. Mathematics can be applied, and women (and men) should try to learn both mathematics and an area to which they can apply it, whether it be psychology, sociology, anthropology, architecture, physics, mechanics, engineering, etc. It keeps one from being narrow and increases job possibilities.

c. Women knowledgeable in mathematics should be able to serve as counselors, perhaps "roving counselors," going to various schools, to discuss career opportunities with students and staff.

d. Communication and mathematics make good combinations to enhance public understanding of mathematics.

e. Women with a knowledge of mathematics and verbal skills can turn to expository talks and articles and books to acquaint others with mathematics. This can be a highly interesting and profitable field. The biographies of mathematicians, for example, can make fascinating reading, as witness Constance Reid's superb book on Hilbert and her forthcoming book on Courant.[7]

f. Teachers - good teachers - are needed and may be in demand after the public outcry over the drop in Math SAT scores.

g. Teachers, advisors, counselors seemed to have the impression that there were few mathematical career opportunities for women, which may explain in part some of the discouragement and different treatment that they received, Students also voiced this opinion and gave it as a reason for not majoring in mathematics. For example, one first year college women student wrote, "If I thought that I could get a job using math, I would change my major to math right now." Others changed their major from mathematics because they did not know of any job opportunities. Generally students did not know what to do with mathematics except to teach it. While the employment picture is not bright, it is not as dismal as they paint it. Teachers, advisors and

students should be kept informed of career opportunities in the mathematical sciences.

2. Professional recommendations:

The recommendations which have been received from various sources refer to more fellowships for those not affiliated with a university or institute, special fellowships and scholarships for women, child-care provisions in fellowships. Some respondents thought that universities should broaden their conception of community service to include raising of a family. Tenure provisions need re-evaluation, in particular the "up or out" notion and the stipulation of a specific number of years in which to make certain professional progress. Tenure for part-time work was suggested (and is already in effect in a few universities, e.g., the University of Waterloo). Redefinition was proposed of the notion of professional age, usually taken from the year of the doctoral degree. Written and unwritten anti-nepotism laws are particularly difficult for mathematicians because of the high rate of intramarriage. Most chairmen whom we interviewed frowned on hiring both husband and wife for positions with tenure or leading to tenure. Some would do only if both were the "best" available for the given positions. The question was raised if mathematicians can do their best work when husband or wife have to commute long distances or be separated during the week, as some younger couples are, in order that both be employed in mathematical positions. While some departments go out of their way not to hire a competent women because she is married to a member of the department, others consider that it is no worse than hiring an uncle and a nephew or two close friends. In recent years more departments include spouses both of whom have tenure. We interviewed several such husband-wife teams, as well as their colleagues, and they did not report any special problems. Also mentioned as possibilities were shared teaching and more part-time positions.

3. Implications for Instructional Improvements:

a. There are ways of presenting mathematical material to enhance flexibility and perceptual restructuring. One way is to combine the problem solving approach of George Pólya[8] with the Gestalt psychological approach of Max Wertheimer.[9] This has been done by my husband and me with respect to the teaching of area of regular polygons and volumes of regular solids. We have had good results with boys and girls in the elementary school grades. Years ago we applied the approach to high school geometry with the result that two groups of about 15 girls each who had failed the New York State geometry regent examination passed with an average grade in the 80's. We are now applying it to selected topics in the calculus and hope to expand this work. Related to it is our attempt to develop material, suitable for students and teachers, based on historical development of the calculus.

b. The educational pendulum has swung from rote learning by drill to teaching of abstract structures and set theoretical terminology . These may be central to foundations of mathematics but not to concrete mathematical problems. What we are advocating are problem solving approaches which enable the learner to get insights into the particular structure of a particular problem and to become more adept at recentering so as to arrive at a possible solution. Such an approach can be combined with learning by drill or learning to make certain skills habitual. Mechanization has a place in learning mathematics. Also emphasized is the distinction between a good guess and a bad guess, between a good error and a bad error.[10]

c. Tests of flexibility-rigidity have been used and show somewhat less flexibility for women, probably as a result of internal and external factors. The use of problems that involved finding areas by restructuring figures showed mathematics students to be better than those not studying mathematics and females not quite as good as males. The finding may be related to differences in flexibility or to differences in spatial perception. What is required is to find methods which can teach students to become more flexible and more adept at problem solving. This

will not necessarily make girls winners of national Putnam mathematical contests or Mathematical Olympics but it may enable more girls (and more boys) to learn how to approach mathematical problems and how to enjoy them.

d. A historical-cultural approach, emphasizing the people who discovered or created mathematics and the times in which these occurred.[11] Concern with the humanistic aspects of mathematics may make it more appealing to both females and males.[12] The roles of mathematics in our society should also be dealt with, so that students have some idea of what mathematicians do. Consideration should be given to a course on the senior high school or first year college level that acquaints students with various options that could be followed for further study, e.g., applied mathematics, operations research, computer science.

e. A concern with intuitive-recreational mathematics, from the lower grades to the adult education level. Our respondents were often attracted to mathematics because it was fun; stress on the fun and puzzle-solving aspects of mathematics may help to dispel some of the fear of the subject. Mathematical skills and routines would still have to be learned, and even made habitual, so that they are available for problem-solving and puzzle-solving, and for the many ways in which mathematics is used by citizens of a scientific society. Theorem-proving should be stressed in courses such as geometry which also attracted many of our respondents.

4. Impact on university:

The study has fostered an interest in women and by women concerning Rensselaer Polytechnic Institute. It is difficult to separate this impact from that of other attempts that have been going on to encourage women and to encourage a humanistic historical-cultural outlook.

a. There are now more women mathematics majors at Rensselaer. Two years ago there were no female mathematics majors in the graduating class. This year 20% of the senior mathematics majors are women, with women leading the class academically.

b. There are more women mathematics graduate students and more who receive the Ph.D. degree. It was four years ago that the first women received the doctoral degree from our department and now a total of four have received it and others are well along the way.

c. I am scheduled to talk about my study on March 8, 1976, at a mathematics colloquium at Rensselaer.

d. RPI has introduced an interdisciplinary degree which allows student to combine mathematics with psychology, sociology, or communication.

e. A minisemester course entitled "Sex Differences in the Mathematical Sciences," was given in January 1975, led by myself, a sociologist and a psychologist.

f. Our department is developing a portrait and biographical display of famous mathematicians, including women mathematicians.

g. A Leibnitz display is being developed in honor of the 300th anniversary in 1976 of his work on the calculus. This is being sponsored by the Center for the Study of the Human Dimensions of Technology at Rensselaer, the work being done jointly by a historian of mathematics and a mathematician.

5. Problems that arose:

a. The scope was too ambitious, too many approaches were attempted and have not been completed. However, some of the approaches look very promising and it is hoped to explore them further. In particular, it is hoped to study more psychologists' responses this year and to compare them further with mathematicians' responses. We hope also to particularize some of the curriculum suggestions.

b. A related problem was the underestimation of funds for travel and for analysis of data.

c. Questionnaires took a long time to develop, and returns came in unevenly, and in fact are still coming in.

d. There is some difficulty in interpreting data which is qualitative and emotionally laden and to get it in a form for quantitative analysis.

e. It is difficult to implement some of the suggestions that grew out of the study. Some require societal changes, some are outside the Foundation's province, or could best be handled by outside funding.

6. Improvements the Foundation Might Make:

a. Provide grants directly to individuals who have shown talent in mathematics and promise of research (broadly interpreted), whether or not they are connected with an academic institution.

b. Allow child-care provisions in grants and fellowships.

c. Support the preparation of brochures, slides, and films on women in mathematics and on mathematical careers.

d. Support "roving counselor" programs in which women mathematicians would visit high schools and meet with counselors, teachers, and students.

e. Support interdisciplinary curriculum development for a program in mathematics and communication in order to dispel certain social conceptions of mathematics and of mathematicians and to lead to better public understanding of mathematics. There is no other discipline of which there is so little public understanding (cf. Lynn A. Steen).[13]

f. Support the development and maintenance of historical-cultural mathematical displays.

g. Support study to find out why a relatively small number of universities and mathematics doctoral advisors account for a large number of the Ph.D. degrees received by women in the United States. What can be learned from the atmosphere in the institutions and the attitudes and approaches of these professors?

h. Support educational studies to implement some of the suggestions for curriculum changes which were proposed in this report.

i. Support further studies of comparisons of data on the career patterns and problems of women in mathematics and in other disciplines, such as psychology, biology, dentistry, etc.[14]

Footnotes and References

1. The source is National Research Council, as cited in an interesting article by Evelyn Fox Keller, "Women in Science: An Analysis of a Social Problem," that appeared in Harvard Magazine, October, 1974. More recent data show that in 1973-74 women received about 9.1% and in 1974-75 about 10.1% (103 out of 1,022) of the doctoral degrees in the mathematical sciences from the universities in the United States; AMS Notices, October 1975, Vol. 22, No. 6, p. 308; and AWM Newsletter, January 1976, Vol. 6, No. 1, p. 3.

2. We thank Dr. Alice Shaefer of Wellesley College, past president of the AWM, for supplying these figures. At the time the questionnaire was distributed, in Spring 1975, there were approximately one thousand AWM members, of whom about 200 were males. As of Fall 1975, AWM has over 1100 members, representing virtually every state and 15 foreign countries; AWM Newsletter, January 1976, Vol. 6, no. 1, p. 1.

3. Lester, Richard A. Antibias Regulations of Universities: Faculty Problems and Their Solutions. New York: McGraw-Hill, 1974. Cf. also the critical review of this book, which mentions these issues: Boring, Phyllis Z. Antibias Regulations? A Biased View? AAUP Bulletin, October 1975, Vol. 61, no. 3, pp. 252-255.

4. Cf.. Centra, John A. Women, Men and the Doctorate, Princeton Educational Testing Service, 1974.

5. Similar marital data were found in 1972 for women with Ph.D.'s in mathematics, Cf. Morawetz, Cathleen S. Women in Mathematics, AMS Notices, April 1973, Vol. 20, no. 3, pp. 131-132. However, there are some other differences in data between this study and ours.

6. A survey of various hypotheses about sex differences is found in Maccoby, Eleanor E. and Jacklin, Carol N., The Psychology

of Sex Differences. Stanford University Press, 1974. Cf. also Gray, C. J. A. 3rd Banff Conference for Advanced Study of Theoretical Psychology. University of Alberta. Academy Press, 1973. Our study led to a project which collated the sex differences mentioned in over 500 psychology books found in the library of the University of Guelph. The data await further analysis.

7. Reid, Constance, Hilbert, Springer, 1974.

8. Pólya, George, How to Solve It. Doubleday, 1957.

9. Wertheimer, M. Productive Thinking, Harper, 1945.

10. Luchins, A. S., Mechanization in Problem Solving: the Effect of Einstellung. Psychological Monographs, 1942, 54, No. 6; Luchins, A. S. & Edith H., Wertheimer's Seminars Revisited: Problem Solving and Thinking, Faculty Student Association, SUNY-Albany, 1970.

11. Cf. Kline, Morris, Mathematics in Western Culture, Oxford University Press, 1964; Courant, R., and Robbins, H. What is Mathematics? Oxford University Press, 1943; Bell, E. T., Men of Mathematics, Simon and Schuster, 1937.

12. More emphasis needs to be placed on women mathematicians, past and present. History of mathematics texts tend to pay scant attention to women mathematicians; few students know any famous women mathematicians. For example, when 26 mathematics majors in a junior-senior level algebra class were asked to name famous women mathematicians, 24 gave none, two listed Emmy Noether, and one of the latter also listed Wolkaneski (for Kovalévsky). In contrast, when they were subsequently asked to name three to five famous mathematicians, 22 students answered, listing an average of four (male) mathematicians. Source materials on women mathematicians include Sonya Kovalévsky, Recollections of Childhood, an autobiography, and a biography by Anna C. Leffler, The Century Co., 1895; the account of Emmy Noether in Constance Reid, Hilbert, Springer, 1970; Dubreil-Jacotin, Marie-Louise, Women Mathematicians, in Great Currents of Mathematical Thought, Ed. by F. LeLionnais, Dover, 1971; Lynn M. Osen, Women in Mathematics, MIT Press, 1974.

13. Steen, Lynn A. Public Understanding of Mathematics, AMS Notices, November 1975, Vol. 23, #7, pp. 363-364.

14. In this connection it is interesting that a study of women dentists is being done by Dr. Grace Austin of the New Jersey College of Dentistry. With regard to psychologists, it is of interest to consider an article on the marital status of female and male psychologists at the masters or doctors level; Cuca, Janet, Women psychologists and marriage: A bad match? APA Monitor, January 1976, Vol. 7, No. 1, p. 13. The article used data in a 1975 NSF report, "The 1972 Scientist and Engineer Population Redefined." Our own data on marital status, as well as other statistics, have also been broken down by gender and degree level and will be compared with those of psychologists in forthcoming reports.

Appendix A
Questionnaires

Questionnaires for:

(a) Mathematicians
(b) Graduate students in mathematics
(c) Undergraduate majors in mathematics
(d) Undergraduate non-mathematics majors

These are some of the questionnaires that have been used. Others which have been or are being developed include corresponding questionnaires for psychologists. We have also used various tests of flexibility-rigidity and of perceptual restructuring in mathematical problems. The resulting data will be described in future reports.

Department of Mathematical Sciences

Rensselaer Polytechnic Institute Troy, New York 12181

May 1975

Dear AWM Member:

What attracted you to mathematics? What persons or factors encouraged or discouraged you in your mathematical studies and in your professional career? Should more women be encouraged to seek careers in the mathematical sciences? Assuming that they should, what could be done to encourage them? Please answer these and related questions on the enclosed questionnaire. It is being sent to AWM members as part of a study of the underrepresentation of women in the mathematical sciences that is being done under a grant from the National Science Foundation, administered by the Education Directorate.

Have you been treated differently in your studies or in your professional career because of being a women (or a man, in the case of our male AWM members)? If so, please tell us about your experiences. Do you have any ideas about what can be done to better the professional life of mathematicians? Do you advocate any changes in the teaching of mathematics to attract more female (and male) students? Please tell us your suggestions. Kindly use the back of the questionnaire or additional sheets for more detailed answers or comments.

Individual questionnaires are entirely confidential and will never be identified in any reports. Qualitative and quantitative analyses are planned of the data. The AWM membership will be kept informed of the findings of the study.

Efforts have been made to keep the questionnaire length and format reasonable. Please take the time to answer it now, if possible. It will be very much appreciated if you complete and return it, preferably within a week. A stamped self-addressed envelope is enclosed for your convenience. In order that as many AWM members as possible be represented in this study, your cooperation is earnestly requested.

Sincerely yours,

Edith H Luchins

Edith H. Luchins
Professor of Mathematics

EHL:me

QUESTIONNAIRE FOR MATHEMATICIANS

Please use the back of the questionnaire or other sheets for more detailed answers or comments.

1. At what age, or in what period of your life, did you first become interested in mathematics? What attracted you to it?

2. At what age, or in what period of your life, did you decide on a career in mathematics? What were your reasons for this decision?

3. What people or factors encouraged or facilitated your decision to be a mathematician?

4. What people or factors discouraged or hampered your decision to be a mathematician?

5. Were you treated differently because of being female (or male) as a mathematics student or as a mathematics professional? If possible, give examples: (a) on the pre-college level; (b) on the undergraduate level; (c) on the graduate level; and (d) on the professional level.

6. Assuming that women should be encouraged to consider mathematics as a career, what changes do you think should be made: (a) on the pre-college level; (b) on the undergraduate level; (c) on the graduate level; and (d) on the professional level?

7. Do you think that at the present time more women should be encouraged to study mathematics? Why or why not?

8. If a talented female mathematics student is considering mathematics as a career, possibly combined with marriage and family, what advice would you give her?

9. Why do you think that there have been relatively few women mathematicians? And why are there relatively few at present?

10. Whom do you consider the three most outstanding contemporary women mathematicians?

Career Patterns and Interests

1. Please list career choices you have considered besides mathematics.

2. Why did you prefer mathematics to each of the listed careers?

3. Please list the kinds of non-mathematical positions that you have held.

4. Please list the kinds of mathematical positions that you have held.

5. How was your career pattern influenced by your being a female (or a male)?

6. Your particular branch or specialty in mathematics is _____.

7. What do you like about your particular specialty in mathematics?

8. Your age _____ Sex _____

Highest degree _____ Date of degree _____

Marital status _____ Spouse's occupation _____

Number and ages of children _____

Number of years employed as a mathematician _____

If presently employed, rank or title _____

Name (optional) _____

Please return the completed questionnaire to:

Professor Edith H. Luchins
Department of Mathematical Sciences
Rensselaer Polytechnic Institute
Troy, New York 12181

Questionnaire for Graduate Mathematics Students

Name _____ Age _____ Sex _____

Highest degree attained _____

Undergraduate education at _____

with major in _____

Part I

1. When did you first decide to be a mathematician? and why? _____

2. If you have thought of other career choices, please describe them. _____

3. If you majored in mathematics on the undergraduate level, why did you do so? _____

4. Why did you decide to do graduate work in mathematics?

5. With regard to your decision to be a mathematician, what people or factors encouraged, helped or facilitated it? _____

6. With regard to your decision to be a mathematician, what people or factors discouraged, hampered or resisted it? _____

7. Why do you think that there are relatively few women in mathematics? _____

8. Do you think that mathematics is a good career for a woman? _____ Please explain your answer. _____

_____

9. Do you think that more women should be encouraged to study mathematics? _____ Please explain. _____

_____

10. What can be done to attract more women to mathematics?

_____

_____

_____

_____

_____

_____

Comments on Part I of the questionnaire:

Part II

Please answer this part even though it may involve repetitions of previous answers. Complete or check all that are applicable.

1a. How old were you when you first became interested in arithmetic? _____

b. Did you like arithmetic in elementary school?
☐ very much ☐ somewhat ☐ not at all

c. Were you good at arithmetic in elementary school?
☐ very good ☐ somewhat ☐ not at all

2a. Check those that influenced your decision to be a mathematician.

	In high school	In college
☐ elem. school teacher		
☐ parents	☐ teachers of math	☐ teachers of math
☐ siblings	☐ teachers of science	☐ teachers of science
☐ friends	☐ other teachers_____	☐ other teachers_____
☐ others	☐ students_____	☐ students_____

b. If feasible put 1 next to the most important influence above, 2 next to the second most important, etc.

3a. Please-indicate your degree of satisfaction with the following

	highly satisfied	somewhat satisfied	not at all satisfied
ways your elem. school math was taught	☐	☐	☐
content of elementary school math	☐	☐	☐
texts for elementary school math	☐	☐	☐
way your high school math was taught	☐	☐	☐
content of high school math	☐	☐	☐
texts for high school math	☐	☐	☐
way your college math was taught	☐	☐	☐
content of college math	☐	☐	☐
text for college math	☐	☐	☐

b. Any suggestions for improvements? _____

_____

_____

_____

4a. Of the following features of mathematics, please check those that appeal to you.

- ☐ logical nature
- ☐ rigorous nature
- ☐ derivation of proofs
- ☐ research
- ☐ problem solving
- ☐ need not be verified empirically
- ☐ no laboratory work
- ☐ can be applied to physical world
- ☐ computer aspects
- ☐ other _____

b. If feasible, put 1 next to the feature that appeals to you most, 2 next to the second most appealing, etc.

c. What is it that you like about each of the features that appeals to you and dislike about each of the others? _____

_____

_____

_____

_____

_____

_____

Comments on Part II of the questionnaire:

Questionnaire for Undergraduate Mathematics Majors

Influences on Academic Interests

1. Age _____

2. Sex _____

3. Year in school _____ (Major _____)

4. When did you decide to major in math?

5. What other areas did you consider majoring in before you decided on mathematics? (List in order of preference)

6. Why did you choose math?

7. Was math a strong preference?

8. Are you happy with your choice? Why?

9. Do you ever consider changing your major? Why? To what? Why?

10. When did you first become interested in math?

11. What math courses did you take in high school?

12. What did you like and dislike about each? Why?

13. What interested you the most in each? Why?

14. What math courses have you taken in college?

15. What have you liked and disliked about each one. Why?

16. What has interested you the most in each one? Why?

17. What is your average grade in college math courses?

18. List grades for each course you've taken and indicate what feature contributed to your success or failure to achieve your goal as far as grades were concerned

19. List in order of preference any careers you would like to pursue.

20. Place an X by those that you think are math related.

21. Indicate those things that have encouraged you in pursuing your major including books, school experiences, out of school experiences, friends, teachers, parents, other people.

22. Indicate those things that have discouraged you.

23. What has influenced you the most? Why?

24. What other areas do you have some interest in?

25. Do you think math offers good career possibilities for a woman? Briefly explain.

Questionnaire

School _____ Year in School _____

Age _____ Sex _____

1. What are you majoring in? Why are you majoring in this area? _____

2. When did you decide to major in this area? What influenced your choice?

3. What career or careers do you think you might pursue? _____

4. What other career possibilities have interested you? _____

5. What courses have you taken in mathematics in high school and in college? What were your reactions to them? _____

6. What career opportunities do you think are open to someone who majors in mathematics? _____

7. Why do you think relatively few women major in mathematics? _____

8. What do you think could be done to encourage more women to major in mathematics? _____

9. Do you think more women should be encouraged to enter the mathematical sciences? _____

10. Comments. _____

Appendix B
Tables of Responses

There follow summary tables of responses on the questionnaire sent to AWM members. Computer analysis has also been undertaken of the data and has yielded statistics on correlations and levels of significance. These will be discussed in forthcoming reports which will also give more of the qualitative responses, including excerpts from questionnaires as well as from interviews.

Table 1. Responses to Question 1 by AWM Members.

#1 At what age, or in what period of your life, did you first become interested in mathematics? What attracted you to it?

		Females (n=350)		Males (n=52)	
Age		#	%	#	%
	a. 0-6	45	12.9	9	17.3
	b. 7-11	77	22.0	15	28.9
	c. 12-17	184	52.6	21	40.4
	d. 18-21	22	6.3	6	11.5
	e. 22-25	0	0	1	1.9
	f. after grad. sch.	6	1.7	0	0
	g. no response.	16	4.6	0	0
	Totals	350		52	
Why					
	a. was good at it.	73	20.9	8	15.4
	b. liked numbers.	13	3.7	4	7.7
	c. orderliness & structure, beauty.	43	12.3	9	17.3
	d. word problems, puzzle solving.	33	9.4	2	3.9
	e. applications, useful in other fields.	10	2.9	3	5.8
	f. algebra	33	9.4	2	3.9
	g. geometry	34	9.7	3	5.8
	h. trigonometry	3	.9	0	0
	i. calculus	3	.9	1	1.9
	j. grade school level	14	4.0	5	9.2
	k. high school level	77	22.	6	11.5
	l. college level	18	5.1	1	1.9
	m. impressed by teachers.	70	20.0	9	17.3
	Totals	424		53	

Table 2. Responses to Question 2 by AWM Members.

#2 At what age, or in what period in your life did you decide on a career in mathematics? What were your reasons for this decision?

	Females (n=350)		Males (n=52)	
Age	#	%	#	%
a. 0-6	0	0	0	0
b. 7-11	10	2.9	3	5.8
c. 12-17	115	32.9	13	25.0
d. 18-21	149	42.6	24	46.2
e. 22-25	25	7.1	9	17.3
f. after grad sch.	33	9.4	2	3.9
g. no response.	18	5.1	1	1.9
Totals	350		52	
Why				
a. was good at it	92	26.3	12	23.1
b. liked it, enjoyed it.	116	33.1	26	50.0
c. encouraged by parents & friends.	13	3.7	1	1.9
d. encouraged by teachers & advisors.	33	9.4	2	3.9
1. at H.S. level	15	4.3	0	0.0
2. at college level	14	4.0	2	3.9
3. at grad. level	0	0.0	0	0.0
e. preferred math to other disciplines.	75	21.4	13	25.0
1. over experimental sciences.	36	10.3	12	23.1
2. over engineering	11	3.1	3	5.8
3. over nonscientific disciplines.	28	8.0	1	1.9
f. job opportunities.	44	12.6	3	5.8
g. applications in other fields.	22	6.3	1	1.9
h. financial aid in grad. school.	8	2.3	1	1.9
i. liked problem solving.	9	2.7	0	0.0
j. orderliness & structure that is mathematics.	21	6.0	4	7.7
k. wanted to teach.	53	15.1	4	7.7
1. in H.S.	17	4.9	0	0.0
2. in College, University	15	4.3	2	3.9
Totals	622		87	

Table 3. Responses to Question 3 by AWM Members.

#3 What people or factors encouraged or facilitated your decision to be a mathematician?

	Females (n=350)		Males (n=52)	
	#	%	#	%
Factors				
a. none	23	6.6	4	7.7
b. ability in math, liked math.	54	15.4	5	9.6
c. preferred exactness & elegance of math to other sciences.	11	3.1	1	1.9
d. acceptable alternatives did not exist.	8	2.3	2	3.9
e. acceptable employment did not exist.	5	1.4	2	3.9
f. applications of math to other fields.	10	2.8	0	0
g. fellowships, other aid available	20	5.7	2	3.9
h. future job opportunities	14	4.0	0	0
i. attended all girl school.	14	4.0	0	0
Totals	159		16	
People				
a. none	29	8.3	5	9.6
b. family,friends.	132	37.7	14	26.9
c. colleagues.	20	5.7	3	5.8
d. teachers	224	64.0	36	69.2
1. at pre-college level	102	29.1	7	13.5
2. at under grad level	109	31.1	20	38.5
3. at grad level	21	6.0	8	15.4
e. advisors	31	8.9	4	7.7
1. at pre-college level	5	1.4	0	0
2. at under grad level	12	3.4	0	0
3. at grad level	9	2.6	0	0
f. at professional level.	4	1.1	1	1.9
g. people (includes b,c,d,e,f)	273	78.0	42	80.8
Totals	971		140	

Table 4. Responses to Question 4 by AWM Members.

#4 What people or factors discouraged or hampered your decision to be a mathematician?

	Females (n=350)		Males (n=52)	
	#	%	#	%
Factors	89	25.4	12	23.1
a. none	236	67.4	39	75.0
b. unavailability of jobs	18	5.0	3	5.8
1. didn't want to teach	3	.9	0	0
c. lack of self confidence	10	2.9	1	1.9
d. factors were based on one's sex	27	7.7	1	1.9
1. feeling that a woman could not succeed in the predominantly "male" field.	9	2.6	0	0
2. did not want a traditional job, e.g. teaching H.S.	4	1.1	0	0
e. no role models	9	2.6	0	0
f. nature of math itself	11	3.1	2	3.8
g. traditional responsibilities (as child-rearing) took precedence	11	3.1	0	0
People	162	46.3	14	26.9
a. none	160	45.7	37	71.2
b. family	59	16.9	7	13.5
c. colleagues	22	6.2	0	0
d. teachers	73	20.9	4	7.7
1. male	4	1.1	0	0
2. female	0	0	0	0
3. at H.S.	14	4.0	1	1.9
4. at undergrad. level	29	8.3	2	3.8
5. at grad. level	37	10.6	1	1.9
e. advisors	37	10.6	2	3.8
1. at H.S.	6	1.7	0	0
2. at undergrad level	12	3.4	0	0
3. at grad level	22	6.2	1	1.9
f. reasons based on sex were given above	65	18.6	0	0
1. as "not a job for woman"	22	6.2	0	0
2. "go into education instead"	6	1.7	0	0
g. non-sexist reasons were given	4	1.1	6	11.5
h. severe discouragement was encountered	9	2.6	0	0
No Factors & People	114	32.6	29	55.8
a. no response	25	7.1	1	1.9

Table 5. Responses to Question 5 by AWM Members.

#5 Were you treated differently because of being a female as a mathematics student or as a mathematics professional? If possible give examples on each of the following levels: a) pre-college b) undergraduate c) graduate d) professional.

	Females (n=350)		Males (n=52)	
	#	%	#	%
I. Pre-College				
1) Not treated differently	252	72.0	49	94.23
2) Yes	81	23.14	3	5.77
a) encouraged to enter traditional "female positions"	16	4.57		
b) treated as "strange" by peers	18	5.14		
c) less demands placed on females	10	2.86		
d) discouraged by family	4	1.14		
e) discouraged by faculty	10	2.86		
f) discouraged by advisors	12	3.43		
g) went to all girls school (inapplicable)	21	6.0		
h) girls given lower grades	3	0.86		
II. Undergraduate level				
1) Not treated differently	229	65.43	48	92.31
2) Yes	91	26.0	4	7.69
a) discouraged by faculty	26	7.43		
b) discouraged by advisor	7	2.0		
c) competence and desire doubted, not taken seriously (need to "prove" oneself)	28	8.0		
d) less financial aid than males	1	0.29		
e) encouraged only to teach math in secondary schools	9	2.57		
f) went to all girls school (inapplicable)	36	10.29		
III. Graduate level				
1) Not treated differently	186	53.14	48	92.31
2) Yes	150	42.86	4	7.69
a) discouraged by advisors and professors, not taken seriously	65	18.57		
b) less financial aid than males	18	5.14		
c) confronted by the assumption that a woman would get married and not finish her degree	16	4.57		
d) small amount of peer contact, less chance to study with peers, not accepted socially	16	4.57		
e) denied admission to a school	6	1.71		
IV. Professional level				
1) not treated differently	126	36.0	50	96.15
2) Yes	190	54.29	2	3.85
a) lower salary than equally or less qualified males	41	11.71		
b) less advancement potential	39	11.14		
c) not given tenure	7	2.0		
d) denied employment	24	6.86		
e) competence doubted	29	8.29		

Table 5. (Continued)

	Females (n=350)		Males (n=52)	
	#	%	#	%
IV.2)f) offered position only after all other qualified males had been offered the position	4	1.14		
g) inference of being hired because of legal obligations (filling % quotas for minorities)	7	2.0		
h) confronted w/peer feelings that as married woman, she was taking away a job that a family man needed	6	1.71		
i) not informed of planning, projects, informal group meetings (hence not truly accepted by peers)	5	1.43		
j) never worked as a professional mathematician	14	4.0		
k) less opportunity for summer school employment	3	0.86		
l) problems related to social relations with peer workers (e.g. dating discouraged)	22	6.29		
V. Treated differently, but felt this was an advantage	7	2.0		
VI. Treated differently in a severe and damaging way	13	3.71		

Table 6. Responses to Question 6 by AWM Members.

#6 Assuming that women should be encouraged to consider mathematics as a career, what changes should be made: a) at the pre-college level b) on the undergrad level c) on the grad level d) on the professional level

		Females (n=350)		Males (n=52)	
		#	%	#	%
	1. No Response	37	10.57	10	19.23
	2. none, at all levels	16	4.58	5	9.62
A.	1. none needed at pre-college level	7	2.0	0	0.0
	2. more role models	58	16.57	9	17.31
	3. equal treatment of males & females	50	14.29	10	19.23
	4. make teachers & advisors more aware of the career opportunities in mathematics	74	21.14	11	21.15
	5. change attitudes, eliminate stereotype of mathematics as unfeminisic	126	36.0	22	42.31
	6. put greater emphasis on math, encourage 4 years	39	11.14	3	5.77
	7. encourage women, stop discouraging them	42	12.0	5	9.62
B.	1. none needed at undergrad level	13	3.71	3	5.77
	2. more role models	75	21.43	6	11.54
	3. equal treatment for males and females	33	9.43	5	9.62
	4. make career opportunities known	36	10.29	4	7.69
	5. change attitudes, eliminate stereotypes	75	21.43	14	26.92
	6. actively encourage talented women, recruit them	22	6.29	4	7.69
	7. stop discouraging them	6	1.71	1	1.92
C.	1. none needed at grad level	13	3.71	3	5.77
	2. more role models	72	20.57	7	13.46
	3. equal treatment	42	12.0	7	13.46
	4. change attitudes, eliminate stereotypes	76	21.71	10	19.23
	5. recruit women	3	.86	1	1.92
	6. encourage women	12	3.43	3	5.77
	7. offer fellowship money on basis of ability alone and offer more of it	12	3.43	2	3.85
	8. offer greater possibilities for part time study	7	2.0	0	0.0
D.	1. none needed at professional level	3	.86	1	1.92
	2. more role models	43	12.29	7	13.46
	3. equal treatment in salary & responsibilities	61	17.43	7	13.46
	4. actively recruit women	8	2.29	1	1.92
	5. make shared positions available	3	.86	0	0.0
	6. eliminate nepotism restrictions	4	1.14	0	0.0
	7. allow maternity leaves	5	1.43	1	1.92
	8. need more serious part time jobs available	21	6.0	2	3.85
	9. allow for more flexible hours	11	3.14	2	3.85
	10. day care needed	8	2.29	0	0.0
	11. change attitudes	75	22.29	8	15.38
	12. stop discouraging women	6	1.71	0	0.0

Table 7. Responses to Question 7 by AWM Members.

#7 Do you think, that at the present time, more women should be encouraged to study mathematics? Why or why not?

	Females (n=350)		Males (n=52)	
	#	%	#	%
I. no response - no opinion	15	4.29	3	5.77
II. Yes				
a. no reason given	75	21.43	7	13.46
b. why not?	8	2.29	1	1.92
c. so as to eliminate the current imbalance	12	3.43	8	15.38
d. greater presence of women can help mathematics	19	5.43	0	0.0
e. for those persons who are highly talented	35	10.0	2	3.85
f. since good math background is vital in many other areas.	23	6.57	1	1.92
g. women are better than men in math .	5	1.43	0	0.0
h. university teaching is excellent career for women	3	.86	0	0.0
i. should not waste this untapped talent	7	2.0	3	5.77
j. job opportunities are available to women now	6	1.71	2	3.85
k. to the extent that they should not be discouraged	9	2.57	2	3.85
l. everyone should be encouraged to study whatever they please	21	6.0	2	3.85
m. men & women should be given equal opportunities & equal encouragement	13	3.71	4	7.69
n. however, jobs are scarce	12	3.43	3	5.77
o. but consider non-academic careers and applications	19	5.43	1	1.92
Totals	282	80.57	39	75.0
III. No				
a. no reason given	3	.86	0	0.0
b. no one (either sex) should be encouraged	7	2.0	1	1.92
c. jobs are not available (for either sex)	27	7.71	6	11.54
d. except for those who are highly talented.	10	10.0	1	1.92
e. because of the present attitudes towards women	1	.29	0	0.0
f. people should be encouraged to do whatever they wish.	6	1.71	1	1.92
g. not a good job for a woman	1	.29	1	1.92
Totals	55	15.71	10	19.23
IV. If and only if student is highly talented (neither yes nor no)	13	3.71	3	5.77

Table 8. Responses to Question 8 by AWM Members.

#8 If a talented female math student is considering mathematics as a career, possibly combined with marriage and a family, what advice would you give her?

	Females (n=350)		Males (n=52)	
	#	%	#	%
1. no response	17	4.86	2	3.85
2. none	16	4.57	4	7.69
3. don't know	13	3.71	2	3.85
4. yes-do it	165	47.14	26	50.0
5. no-don't do it	2	0.57	1	1.92
6. get as much education as possible	11	3.14	1	1.92
7. be versatile, include usable subjects	17	4.86	0	
a. such as statistics	3	0.86	0	
b. such as computer science	3	0.86	0	
c. such as mathematics suitable for industry	5	1.43	0	
8. attend a school which has female faculty members	1	0.29	0	
9. attend an all women school as an undergrad	1	0.29	0	
10. choose husband carefully, need understanding spouse	63	18.0	11	21.15
11. don't marry until career is underway, or not at all	17	4.86	2	3.85
12. postpone having children	30	8.57	2	3.85
13. don't have a family	5	1.43	0	
14. have a small family	1	0.29	0	
15. Beware: your career goals and your spouse's may not always agree.	15	4.29	2	3.85
16. Beware: It is very difficult to combine traditional family duties with the traditional math career.	17	4.86	3	5.77
17. success demands full time immersion	5	1.43	1	1.92
18. be professional, take career as seriously as a man would	19	5.43	4	7.69
19. It will take a great deal of energy	9	2.57	1	1.92
20. don't take time off	11	3.14	3	5.77
21. can't use family as excuse for poor performance	2	0.57	0	
22. keep at it at least part time, don't get stale	9	2.57	0	
23. be prepared to give up your sexuality	1	0.29	0	
24. be prepared for discrimination, will have to prove one self	16	4.57	2	3.85
25. math is a good career to combine with family	14	4.0	0	
26. do it, math is good background for many careers	0	0.0	0	
27. find good day care	7	2.0	0	
28. get good household help	7	2.0	0	

Table 8. (Continued)

#8 (Continued)	Females (n=350) #	%	Males (n=52) #	%
29. find other female professionals to confide in	4	1.14	1	1.92
30. be confident, don't get discouraged	10	2.86	0	
31. beware, jobs are scarce	11	3.14	4	7.69
32. it may not be worth the hassle	2	0.57	0	
33. be flexible	8	2.29	0	
34. you will be expected to hold 2 jobs: housekeeper & math'n	2	0.57	0	
35. be prepared for the difficulties that will arise	38	10.86	7	13.46
36. be agressive	4	1.14	1	1.92
37. you and spouse must have mutual understanding concerning career and family priorities	13	3.71	3	5.77
38. don't marry a mathematician.	4	1.14	0	
39. place your family first	2	0.57	0	

Table 9. Responses to Question 9 by AWM Members.

#9 Why do you think that there have been relatively few women mathematicians and why are there few at present?

	Females (n=350)		Males (n=52)	
	#	%	#	%
1. no response	35	10.0	4	7.7
2. mathematics is not a special case.	21	6.0	3	5.8
a. The proportion of females in mathematics is the same as in other sciences.	7	2.0	0	
b. For the same reasons that there are few females in other disciplines.	14	4.0	1	1.9
3. social and cultural reasons	273	78.0	39	75.0
a. females are discouraged at an early age.	57	16.3	6	11.5
b. females are subject to different experiences and treatment when young.	23	6.6	4	7.7
c. academic interests are not encouraged.	55	15.7	3	5.8
d. belief that mathematics is not feminine but masculine.	73	20.9	10	19.2
e. females are discouraged from competing with men.	21	6.0	3	5.8
f. teachers and parents have lower expectations of females.	13	3.7	0	
g. females are not encouraged to think in terms of careers.	44	12.6	8	15.4
h. traditional responsibilities do not allow a demanding career.	55	15.7	1	1.9
4. women prefer other disciplines and careers	22	6.3	2	3.8
a. more people oriented fields.	5	1.4	0	
b. more creative disciplines.	3	.9	0	
c. women are brought up to think in practical terms and not abstract ones.	5	1.4	1	1.9
d. the nature and image of mathematics discourages women.	5	1.4	0	
e. women are not logical	1	0.3	0	
5. women are discriminated against	77	22.0	14	26.9
a. with respect to career availability and advancement potential.	31	8.9	3	5.8
b. with respect to graduate school, admissions and awarding of financial aid.	30	8.6	3	5.8
c. different treatment at undergraduate level.	18	5.1	3	5.8
d. different treatment at pre-college level.	10	2.9	4	7.7
6. don't know.	11	3.1	8	15.4

Tables 1'- 2'. Responses to Questions 1' and 2' by the AWM Members.

#1' Please list career choices you have considered besides Math.

#2' Why did you prefer mathematics to each of the listed careers?

		Females (n=350)		Males (n=52)	
		#	%	#	%
#1'	no response	23	6.57	0	0.0
	no others considered	48	13.71	7	13.46
	Physics	46	13.14	17	32.69
	Chemistry	38	10.86	7	13.46
	Biology	17	4.86	4	7.69
	Engineering	26	7.43	17	32.69
	Medicine	37	10.57	8	15.38
	Law	17	4.86	5	9.62
	Statistics	3	0.86		
	Computer Science	34	9.71	2	3.85
	Actuarial Science	8	2.29	1	1.92
	Business	13	3.71	3	5.77
	Secretary	3	0.86	3	0.86
	Research Analyst	1	0.29	1	0.29
	English, literature	15	4.29	1	1.92
	Art	16	4.57		
	Languages	20	5.71	2	3.85
	History	12	3.43	1	1.92
	Philosophy	14	4.0	1	1.92
	Music, Dance, Drama	44	12.57	2	3.85
	Psychology	18	5.14		
	Teaching, Education	57	16.29	5	9.62
	Counselling	3	0.86		
	Home Economics	4	1.14		
	Physical Education	2	0.57	2	3.85
	Housewife	9	2.57		
	Writing, Journalism	23	6.57	3	5.77
	Accounting	6	1.71	3	5.77
	Economics	1	2.0	1	1.92
	Fashion Design	3	0.86		
	Armed Forces	2	0.57	1	1.92
	Church Work, Clergy	2	0.57	1	1.92
	Architecture	7	2.0	2	3.85
	Nursing	2	0.57		
	Astronomy	1	0.29	1	1.92
	Airline Stewardess	1	0.29		
	Pharmacy	2	0.57		
	library, science	3	0.86	1	1.92
	Crafts	2	0.57		
	Operations Research	4	1.14		
	Oceanography	1	0.29		
	Lab Tech.	1	0.29		
	Social Work	3	0.86		
	Naturalist	1	0.29		
	Photographer	1	0.29		
	Geology	1	0.29	1	1.92
	Political Science	1	0.29	2	3.85

Table 2'. Responses to Question 2 by AWM MEMBERS

#2' Why did you prefer mathematics to each of the listed careers?

		Female (n=350)		Males (n-52)	
		#	%	#	%
#2'	No Response	71	20.29	10	19.23
	Did not choose math "over" the other careers	62	17.71	5	9.62
	Career Opportunities	43	12.29	4	7.69
	Liked Math Better	100	28.57	10	19.23
	Did well(better)in Math	41	11.71	10	19.23
	More intellectual, challenging, precise	61	17.43	16	30.77
	More creative	49	14.0	7	13.46
	Less memorization	10	2.86	0	0.0
	Preferred academic Career with its flexibility, etc.	31	8.86	1	1.92
	Was encouraged towards math instead.	6	1.71	1	1.92
	Other fields not readily available to women	15	4.29	0	0.0
	No opportunity was available to pursue other fields.	24	6.86	4	7.69
	Inspired by teachers.	1	0.29	0	0.0
	Math is less boring, more exciting & interesting.	25	7.14	9	17.31
	No labs -	7	2.0	2	3.85

Table 3' . Responses to Question 3' by AWM Members.

#3' Please list the kinds of non-mathematical positions that you have held.

	Females (n=350)		Males (n=52)	
	#	%	#	%
1. none	73	20.9	15	28.8
2. no response	39	11.1	4	7.7
4. summer, part time only	40	11.4	4	7.7
5. housewife, mother	14	4.0		
6. teaching & related	69	19.7	10	19.2
a. not specific teaching	4	1.1		
b. high school	13	3.7	1	1.9
c. grammer school, kindergarten	12	3.4		
d. physics or chem lab instructor	5	1.4	1	1.9
e. computer science instructor	1	0.3		
f. counselor	6	1.7		
g. teaching assistant	3	0.9		
i. educ. research associate	2	0.6		
j. educ. director	4	1.1	1	1.9
k. college level teaching	14	4.0		
l. phys. ed., dance, music, swimming teaching	6	1.7	3	5.8
m. administrative	8	2.3	3	5.8
7. scientist	33	9.4	3	5.8
a. physics	6	1.7		
b. chemistry	6	1.7	1	1.9
c. research assistant or associate	20	5.7	2	3.8
d. astronomy	2	0.6		
e. other	3	0.9		
f. statistics	2	0.6		
8. actuarial trainee	4	1.1	1	1.9
9. service oriented	39	11.1	4	7.7
a. waitress	25	7.1	1	1.9
b. hairstylist	1	0.3		
c. house maid	3	0.9		
d. baby sitter	8	2.3		
e. gas station attendant	1	0.3	2	3.8
f. telephone operator	2	0.6		
10. lab technician	5	1.4	1	1.9
11. manufacturing	7	2.0	5	9.6
12. programming	28	8.0	4	7.7
a. system analyst	4	1.1		
13 engineering	10	2.9	4	7.7
a. aid	6	1.7		
14. accounting	3	0.9		
a. assistant	2	0.6		
15. library work	11	3.1		
16. office work	74	21.1	2	3.8
a. clerk, clerical	41	11.7	2	3.8
b. bookkeeper	7	2.0		
c. secretary	23	6.6		
d. other	3	0.9		
e. supervisor, manager	5	1.4		
f. cashier	3	0.9		

Table 3' . (Continued)

	Females (n=350)		Males (n=52)	
	#	%	#	%
17. health related	13	3.7	2	3.8
a. nurse or aid	3	0.9		
b. counsellor	1	0.3		
1. drug	0	0.0		
c. rehabilatation	1	0.3		
d. administrator, program director	5	1.4		
e. research	2	0.6	1	1.9
f. clerk or other	3	0.9	1	1.9
18. sales, clerk	19	5.4	2	3.8
19. media	21	6.0	1	1.9
a. editor	5	1.4		
1. editorial assistant	1	0.3		
b. writer	6	1.7		
c. reader	1	0.3		
d. reporter	3	0.9		
e. translator	2	0.6		
f. interviewer	2	0.6		
20. business	10	2.9	3	5.8
a. executive	4	1.1	3	5.8
b. research	2	0.6		
c. other	2	0.6		
21. summercamp	12	3.4		
a. director	1	0.3		
b. counsellor	11	3.1		
22. government, civil service	6	1.7	1	1.9
23. military service	3	0.9	5	9.6
24. politics	1	0.3		
25. operations research	2	0.6		
26. artist, musician	2	0.6	1	1.9
27. mechanics	1	0.3		
28. lawyer	1	0.3	1	1.9

Table 4'. Responses to Question 4' by AWM Members.

#4' Please list the kinds of mathematical positions that you have held.

	Females (n=350)		Males (n=52)	
	#	%	#	%
1. no response	10	2.9	1	1.9
2. none	4	1.1	0	
I. academic	313	89.4	51	98.1
a. pre-college level	61	17.4	5	9.6
1. grade school level	7	2.0	1	1.9
2. high school level	57	16.3	4	7.7
3. administrative	4	1.1	0	
b. college or university level	283	80.9	46	88.5
1. teaching assistant or research assistant.	86	24.6	8	15.4
2. instructor or lecturer	95	27.1	15	28.8
3. assistant professor	92	26.3	19	36.5
4. associate professor	36	10.3	21	40.4
5. full professor	18	5.1	17	32.7
6. post doctoral fellow	5	1.4	2	3.8
7. research associate	11	3.1	2	3.8
8. administrative	9	2.6	9	17.3
a. department chairman	7	2.0	6	11.5
b. program coordinator	3	.9	3	5.8
c. education literature	16	4.6	2	3.8
1. writer or editor	15	4.3	2	3.8
2. motion pictures, educational	0	0.0	0	
3. translator	1	.3	0	
II. non-academic	106	30.3	16	30.8
a. computing	41	11.7	3	5.8
1. programming	33	9.4	2	3.8
2. systems analyst	6	1.7	0	
b. actuary	8	2.3	1	1.9
1. trainee or student	6	1.7	0	
c. accounting	2	.6	0	
1. assistant	1	.3	0	
d. statistician	22	6.3	1	1.9
1. consultant	3	.9	0	
e. mathematician in industry or government	40	11.4	12	23.1
1. math analyst	11	3.1	1	1.9
f. engineer	6	1.7	0	
1. assistant or aid	5	1.4	0	
g. operations research analyst	2	0.6	0	

Table 5'. Responses to Question 5' by AWM Members.

#5' How was your career pattern influenced by your being a female (or male)?

	Females (n=350)		Males (n=52)	
	#	%	#	%
I. Influenced				
1. no response	32	9.14	13	25.0
2. don't know	12	3.42	8	15.38
3. no-not affected	60	17.14	16	30.76
4. yes-in non-unfavorable manner	16	4.57	1	1.97
5. yes-with no explanation	25	7.14	8	15.38
6. yes- explanation follows	205	58.57	6	11.53
II. Explanations				
1. took academic job because of lack of opportunities in industry or elsewhere	13	3.71		
2. took academic job to have time for family, flexible time schedule	25	7.14		
3. took part time job to have time for family.	6	1.71		
4. location of employment was dictated by spouse's career	54	15.42		
a. had to follow spouse	15	4.28		
b. could not accept offers of positions.	6	1.71		
5. had difficulty in combining job with family responsibilities	26	7.42		
6. career interrupted because of family responsibilities.	63	18.0		
7. was highly motivated to excel in "man's" field	7	2.0		
8. did not receive the encouragement a man would	20	5.71		
9. was able to work because I wanted to, not because I had to.	13	3.71		
10. was not subjected to the pressure to excel as men are	20	5.71		
11. promotions came slower or were denied	12	3.42		
12. was regarded as temporary	6	1.71		
13. chose math over other careers	12	3.42		
14. teaching assignments were based on my sex	3	0.85		
15. never took time off, fearing inability to return later	1	0.28		
16. victim of nepotism	4	1.14		
17. was not taken seriously	17	4.82		
18. no fellowship support	5	1.42		
19. was encouraged			1	1.92
20. got position female would not have			3	5.76
21. was drafted into Army			1	1.92
22. more time to devote to career than if were a female			1	1.92

Table 6' 7'. Responses to Questions 6' and 7' by AWM Members.

#6' What is your specialty in mathematics?

#7' What do you like about your specialty in mathematics?

		Females (n=350)		Males (n=52)	
		#	%	#	%
#6'	1. no response	17	4.86	0	0.0
	2. none	2	0.57	0	0.0
	3. Analysis	37	10.57	16	30.8
	4. Topology	29	8.29	9	17.3
	5. Geometry	13	3.71	3	5.77
	6. Algebra	80	22.86	7	13.46
	a. group theory	11	3.14	2	3.85
	b. semi group theory	1	0.29	0	0.0
	c. ring theory	4	1.14	0	0.0
	d. linear algebra & matrix theory	2	0.57	0	0.0
	7. Number theory	16	4.57	6	11.54
	8. Logic & Foundations	17	4.86	2	3.85
	9. History of Mathematics	2	0.57	0	0.0
	10. Differential Equations	9	2.57	2	3.85
	11. Probability & Statistics	30	8.57	4	7.69
	12. Computer Science & Related	24	6.86	2	3.85
	a. theory of computation	2	0.57	0	
	b. automata theory	1	0.29	0	
	13. Numerical Analysis	7	2.0	2	3.85
	14. Bio-Mathematics	4	1.14	0	
	15. Ergodic Theory	1	0.29	0	
	16. Summability theory	1	0.29	0	
	17. Applied Mathematics (not specific)	11	3.14	1	1.92
	18. Mathematical Programming	0	0.0	0	
	19. Operations Research	7	2.0	0	
	20. Operator theory	1	0.29	0	
	21. Approximation Theory	4	1.14	0	
	22. Mathematics Education	38	10.86	0	
	a. math for educators	2	0.57	0	
	b. math for non math majors	2	0.57	0	
	23. mathematical physics	5	1.43	0	
	24. complex variables	11	3.14	4	7.69
	25. combinatorics	9	2.57	3	5.77
#7'	1. fun	22	6.29	4	7.69
	2. practical applications	59	16.86	12	23.08
	3. geometric structure	11	3.14	2	3.85
	4. universality, touches other fields in math	14	4.0	7	13.46
	5. it is foundation	3	0.86	1	1.92
	6. structure, beauty	39	11.14	4	7.69
	7. deals with people	23	6.57	0	0.0
	8. challenge	9	2.57	2	3.85
	9. advisor was receptive	6	1.71	0	0.0
	10. abstractness	10	2.86	3	5.77
	11. no response	71	20.29	12	23.08